UNDP-1 Universal Notebook Data Platform

User Guide

80-VF329-3 Rev. C

December 20, 2007

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Revision history

Revision	Date	Description
A	November 2007	Initial release
B	November 2007	Added label information in compliance details (Section 6.2.2)
C	December 2007	Updated Section 6.2.2 Added Section 6.2.3

1 Introduction

1.1 Documentation overview

The UNDP-1 Universal Notebook Data Platform is a PCI Express™ Mini Card that enables notebook computer wireless data connectivity. This datacard solution delivers WWAN connectivity for the CDMA2000® 1x, 1x EV-DO, UMTS (HSDPA and HSUPA), and GSM/GPRS/EDGE™ protocols, plus GPS position location, in a single package. The complete UNDP-1 solution includes all hardware and software necessary for embedded wireless connectivity in notebook PCs.

Technical UNDP-1 device information is distributed over the documents listed in Table 1-1. All released UNDP-1 documents are posted at the CDMA Tech Support website (https://support.cdmatech.com) and are available for download.

Table 1-1 UNDP-1 documentation

Document Number	Title/Description
80-VF329-1	*UNDP-1 Universal Notebook Datacard Platform Device Specification* The primary objective of this document is to convey all UNDP-1 electrical and mechanical specifications. Additional material includes pin assignment definitions, packing methods and materials, and ordering information. This document can be used by company purchasing departments to facilitate procurement.
80-VF329-3 (this document)	*UNDP-1 Universal Notebook Datacard Platform User Guide* This document describes all UNDP-1 functions and interfaces, defines how to power and control the platform, and provides hardware integration guidelines.

This UNDP-1 user guide is organized as follows:

Chapter 1 Provides an overview of UNDP-1 documentation, presents a functional block diagram for an example application, gives a high-level functional description of the UNDP-1 device, and defines terms and acronyms used throughout this document.

Chapter 2 Provides pin assignments and detailed descriptions.

Chapter 3 Defines how to power and control the UNDP-1 platform and describes its operating modes.

Chapter 4 Provides RF integration guidelines.

Chapter 5 Describes UNDP-1 methods for communicating with the host computer and its user.

Chapter 6 Provides standards compliance and regulatory information.

Table 1-2 lists documents referred to throughout the UNDP-1 document-set; consult them for additional information.

Table 1-2 Reference documents

Ref No.	Document
[1]	*QUALCOMM WWAN Connection Manager API (*80-VF219-1)
[2]	*Supplement to Streaming Download Protocol* (80-VF459-1)
[3]	*Antenna Design Guidelines for Laptop and Notebook Computers* (80-H2929-1)
[4]	*FCC Regulations - CFR 47, Part1, 2, 15, 22 and 24*
[5]	*PCI Express Mini Card Electromechanical Specification*, Revision 1.1
[6]	*Universal Serial Bus Specification*, Revision 2.0
[7]	*Protection of Electrical and Electronic Parts, Assemblies, and Equipment* (ANSI/ESD S20.20-1999)

1.2 Application description

The UNDP-1 platform (Figure 1-1) includes a universal embedded data-connectivity modem in the form of a PCI Express Mini Card, plus the associated software suite for notebook PC applications. Its supported airlinks are as follows:

- Dual-band CDMA2000 (1X and/or 1x EV-DO):
  - Cellular band
    - Band class 0: 869 to 894 MHz reception; 824 to 849 MHz transmission
  - PCS band
    - Band class 1: 1930 to 1990 MHz reception; 1850 to 1910 MHz transmission
- Tri-band UMTS (WCDMA R99, HSDPA, and/or HSUPA):
  - Cellular band
    - Band V: 869 to 894 MHz reception; 824 to 849 MHz transmission
  - PCS band
    - Band II: 1930 to 1990 MHz reception; 1850 to 1910 MHz transmission
  - IMT band
    - Band I: 2110 to 2170 MHz reception; 1920 to 1980 MHz transmission
- Quad-band GSM (GSM, GPRS, and/or EDGE):
  - GSM850 band
    - 869 to 894 MHz reception; 824 to 849 MHz transmission
  - GSM900 band
    - 925 to 960 MHz reception; 880 to 915 MHz transission
  - GSM1800 band
    - 1805 to 1880 MHz reception; 1710 to 1785 MHz transmission
  - GSM1900 band
    - 1930 to 1990 MHz reception; 1850 to 1910 MHz transmission
- GPS reception centered at 1575.42 MHz (GPS L1 band)

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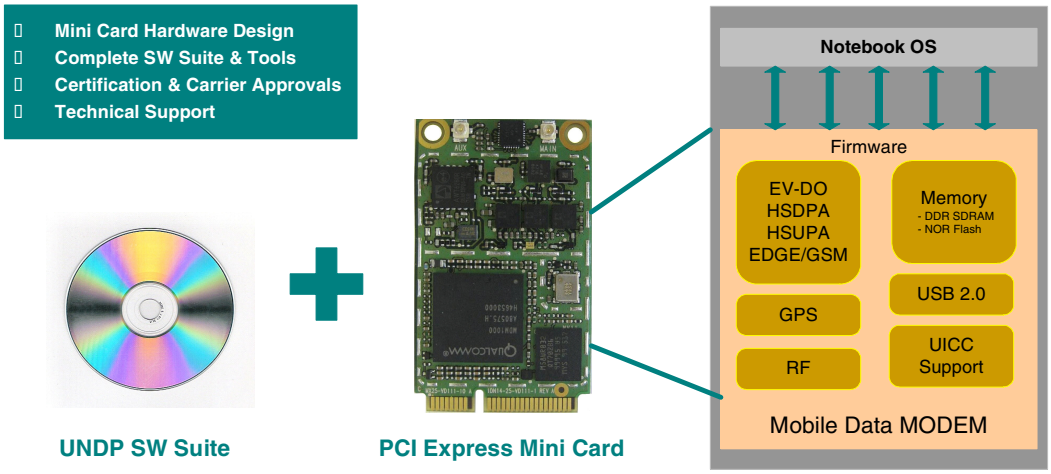

Figure 1-1 UNDP-1 product deliverables

The on-board QUALCOMM ICs include:

- MDM1000™ Mobile Data Modem IC
- RTR6285™ RF Transceiver IC
- RFR6500™ RF Receiver IC
- PM6653™ Power Management IC

Key connectivity support includes:

- USB 2.0 high-speed
- Universal integrated circuit card (UICC) for RUIM/USIM
- Primary and secondary antenna connectors
- Status LED driver output
- DC power supply input and enable/disable control

A high-level hardware block diagram is shown in Figure 1-2. Two Hirose (U.FL-R-SMT) antenna connectors are provided for the following:

1. The primary connector supports transmission and reception by the active CDMA, UMTS, or GSM transceiver.
2. The secondary connector supports diversity reception by the active CDMA or UMTS link plus GPS reception.

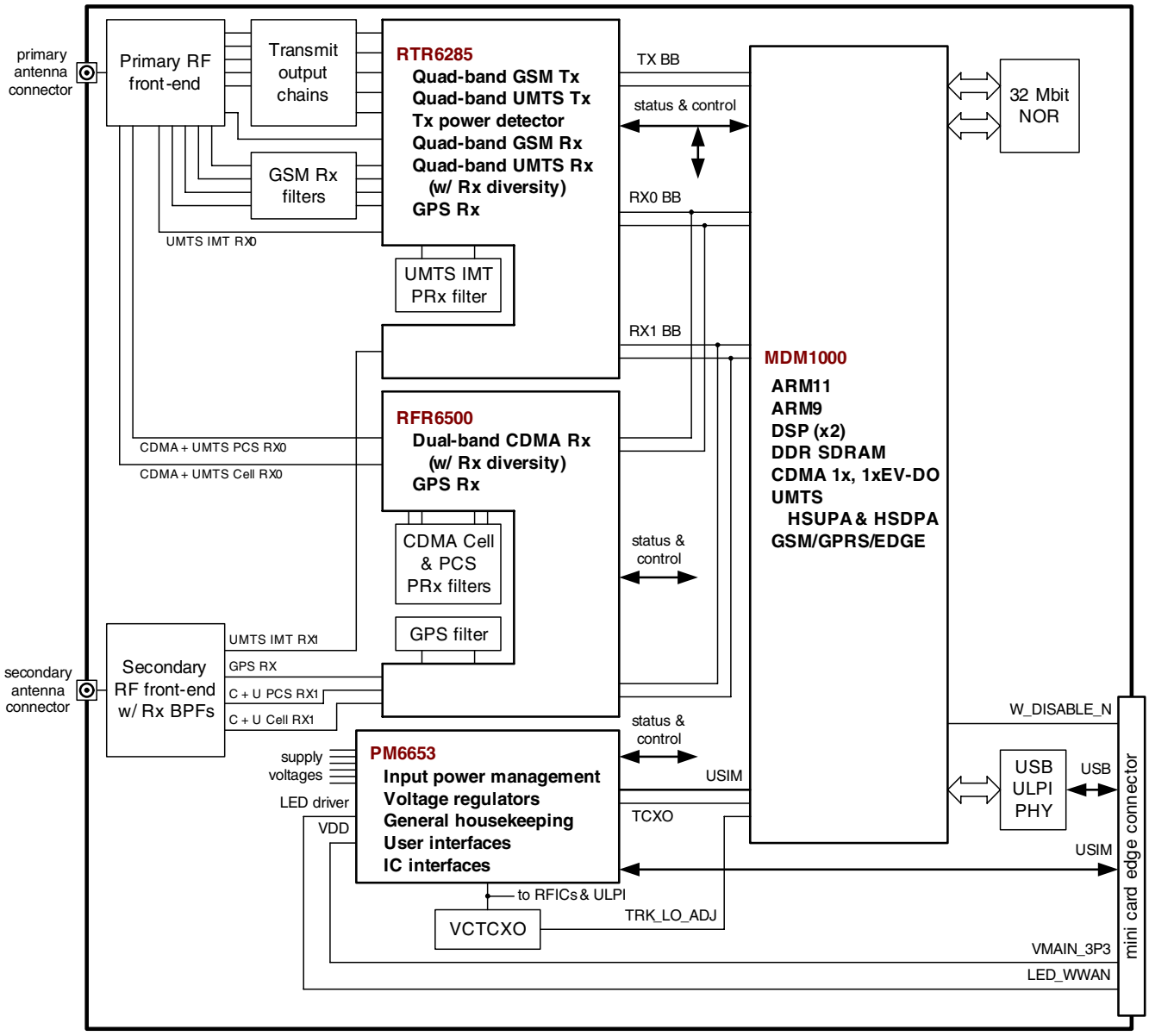

Figure 1-2 Example application functional block diagram

The antenna elements are typically integrated into the notebook computer and connected to the UNDP-1 module via flexible RF coaxial cables. This configuration, when adequate antenna performance is achieved, satisfies the PCI-SIG® standard requirements for PCI Express Mini Cards. Antenna performance requirements are defined in [3] and listed within Table 1-2.

The primary antenna is connected to its RF front-end circuits (a switch module, CDMA and UMTS duplexers, etc). In the transmit direction, these front-end circuits are driven by the transmit output chains: two chains support GSM low and high bands (GSM850 + GSM900 and GSM1800 + GSM1900); three chains support CDMA (Cell + PCS) and UMTS (Cell + PCS + IMT) operation. All baseband-to-RF processing - for all supported bands - is performed within the RTR6285 IC.

The four GSM receive paths are filtered, then routed to the RTR6285 IC for processing. The CDMA and UMTS primary receive filtering is achieved within the front-end duplexers; the signals are then routed to either the RTR6285 IC (UMTS IMT) or the RFR6500 IC (CDMA and UMTS Cell + PCS) for RF-to-baseband processing.

Like the primary antenna, the secondary antenna is connected to its own RF front-end circuits (a switch module, CDMA/UMTS filters, GPS filter, etc). The filtered signals are then routed to the appropriate RFIC for RF-to-baseband processing (RTR6285 IC for UMTS IMT; RFR6500 for CDMA and UMTS Cell + PCS and GPS).

The MDM1000 device provides all the digital baseband processing, including modem functions for all the supported airlinks. Integrated MDM1000 functions include the ARM1136-J™ and ARM926EJ-S™ processor cores; two low-power, high-performance digital signal processor (DSP) cores; and 32 MB stacked dual data rate (DDR) synchronous dynamic random access memory (SDRAM).

UICC (RUIM/USIM) is supported via an offboard UICC connector that is implemented per the PCI Express Mini Card specification, version 1.1. The UNDP-1 UICC interface is compliant with GSM 11.12 and ISO/IEC 7816-3 standards.

In addition to the PCI Express Mini Card edge connector, board-level pads are provided for interfacing to a JTAG fixture.

With its 4 MB of NOR flash memory and 32 MB of RAM (stacked DDR-SDRAM inside the MDM1000), the UNDP-1 supports a new code storage architecture via the QUALCOMM Data Loader (QDL). The Advanced Mobile Suscriber Software (AMSS) image is stored on the PC file system and downloaded to the UNDP-1 device RAM at system startup. NOR flash memory contains a boot image to support the initialization and configuration of the UNDP-1 hardware system, including the RF calibration items. It then enumerates on the USB, and the host computer downloads the embedded software and configuration memory items over the USB using QDL.

Software interfaces that were developed for QUALCOMM chipsets are supported by the UNDP-1 product. The QDL data card interface ISOD describes the C API functions that PC software applications must use to interface with UNDP-1; see [1] listed within Table 1-2 for details. The supplement to the streaming download protocol specification describes the high-speed download protocol; see [2] within the same table for details.

The UNDP-1 platform includes the PM6653 power management IC to detect and validate the applied DC power source, coordinate system powerup and powerdown actions, generate all the required on-board supply voltages, implement the primary on-board clock sources, and provide several secondary functions (such as driving the status LED).

1.3 Terms and acronyms

Table 1-3 defines the terms and acronyms used throughout this document.

Table 1-3 Terms and Acronyms

Term	Definition
AMSS	Advanced Mobile Suscriber Software
CAPI	Computer Application Programmable Interface
CDMA	Code Division Multiple Access
CE	Mandatory conformity marking on many European products
Cell	Cellular band
CTIA	Cellular Telecommunications and Internet Association
DCS	Digital Cellular System at 1800 MHz
DDR SDRAM	Dual Data Rate Synchronous Dynamic Random Access Memory
EDGE	Enhanced Data Rates for GSM Evolution
EMC	Electromagnetic compatibility
ESD	Electrostatic Discharge
FCC	Federal Communications Commission
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
IMT	International Mobile Telecommunications
ISOD	Interface Specification and Operational Description
JTAG	Joint Test Action Group
MDM	Mobile Data Modem
PA	Power Amplifier
PCI	Peripheral Component Interconnect
PCS	Personal Communication System
PHY	Physical layer (USB transceiver)
PM, PMIC	Power Management, PM Integrated Circuit
QDL	QUALCOMM Data Loader
RFR	Radio Frequency Receiver
RoHS	Restriction of Hazardous Substances
RTR	Radio Frequency Transceiver
RUIM	Removable User Identity Module
TIA/EIA	Telecommunication Industry Association / Electronic Industries Alliance
TS	Technical Specification

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Table 1-3 Terms and Acronyms (continued)

Term	Definition
TXCO	Temperature-compensated Crystal Oscillator
UICC	Universal Integrated Circuit Card
ULPI	USB transceiver macrocell interface + low pin interface
UMTS	Universal Mobile Telecommunications System
UNDP, UNDP-1	Universal Notebook Data Platform, -1 refers to a particular QUALCOMM product
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
VCTCXO	Voltage Controlled Temperature-compensated Crystal Oscillator
WCDMA	Wideband Code Division Multiple Access
WLAN	Wideband Local Area Network
WHQL	Windows Hardware Quality Labs
WWAN	Wireless Wide Area Network

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2 External Connections

The UNDP-1 add-in card is compatible with the PCI Express Mini Card 52-pin card edge type connector. The PCI Express Mini Card connector pin assignments are listed in Table 2-1; pins used by the UNDP-1 platform are highlighted in **PINK BOLD** font.

Table 2-1 PCI Express Mini Card connector pin assignments

System connector interface			
Pin #	**Name**	**Pin #**	**Name**
51	N/C	**52**	**+3.3 V**
49	N/C	**50**	**GND**
47	N/C	48	N/C (+1.5 V)
45	N/C	46	N/C
43	GND	44	N/C
41	**+3.3 Vaux**	**42**	**LED_WWAN#**
39	**+3.3 Vaux**	**40**	**GND**
37	**GND**	**38**	**USB_D_P**
35	**GND**	**36**	**USB_D_N**
33	N/C	**34**	**GND**
31	N/C	32	N/C
29	**GND**	30	N/C
27	**GND**	28	N/C (+1.5 V)
25	N/C	**26**	**GND**
23	N/C	**24**	**+3.3 Vaux**
21	GND	22	N/C (PERST_N)
19	N/C	**20**	**W_DISABLE_N**
17	N/C	**18**	**GND**
Mechanical key			
15	**GND**	16	N/C
13	N/C	**14**	**UIM_RST_N**
11	N/C	**12**	**UIM_CLK**
9	**GND**	**10**	**UIM_DATA**
7	N/C	**8**	**UIM_PWR**
5	N/C (COEX2)	6	N/C (+1.5 V)
3	N/C (COEX1)	**4**	**GND**
1	N/C (WAKE_N)	**2**	**+3.3 V aux**

The UNDP-1 platform also provides two RF connectors as antenna ports. Hirose model number U.FL-R-SMT should be used to mate with each port. See Section 1.2 for implementation and interconnection guidelines.

The final set of connections available are the board-level pads available as a JTAG interface.

The EDGE card connector and RF connectors are highlighted in Figure 2-1.

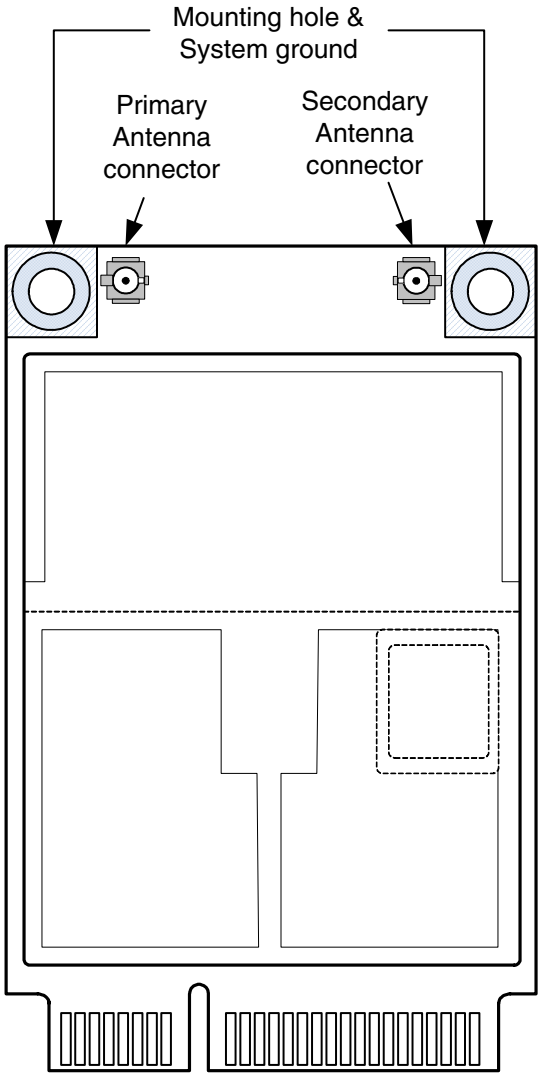

Figure 2-1 External connections

3 DC Power and UNDP Operating Modes

3.1 DC power source

The host computer provides the UNDP-1 power source via the 52-pin card edge connector (Figure 3-1). A nominal supply voltage of 3.3 V is expected, as defined in the *PCI Express Mini Card Electromechanical Specification*, Revision 1.1. UNDP-1 voltage and current specifications are provided in the *Universal Notebook Data Platform Device Specification* (80-VF329-1).

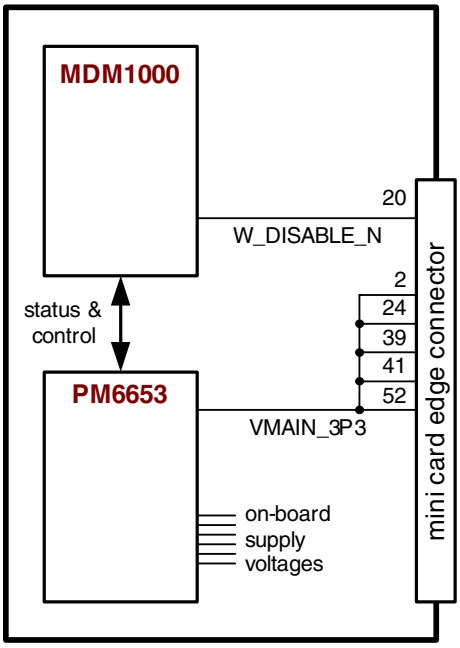

Figure 3-1 DC power connections

With a proper DC power source applied, the UNDP-1 platform is powered up and down as directed by the W_DISABLE_N control signal from the host computer: logic low = disabled; logic high = enabled.

3.2 DC power states

Based on applied DC power and control signals from the host computer, the UNDP-1 platform is set to one of four DC power states, as shown in Table 3-1.

Table 3-1 UNDP-1 DC power states [1]

State	Description
Disconnected	DC power is not applied to the UNDP-1 platform.
Off	DC power is applied to the UNDP-1 platform, but the platform is disabled via the W_DISABLE_N control signal.
Normal	DC power is applied to the UNDP-1 platform, the platform is enabled via the W_DISABLE_N control signal, its USB interface is active, and it is operating in one of the following modes: ■ One of the active airlink modes listed in Table 3-2 (with or without GPS position location) ■ Powerdown ■ Sleep
Low power	DC power is applied to the UNDP-1 platform, the platform is enabled via the W_DISABLE_N control signal, and its USB interface is active. However, the airlink (and all supporting RF, LO, and baseband circuits) is disabled.

[1] Normal and low power states are set by the host computer via the USB interface.

3.3 UNDP operating modes

Example UNDP-1 platform operating modes and their expected data throughput rates are summarized in Table 3-2. Operating modes are set by the host computer via the USB interface.

Table 3-2 UNDP-1 operating modes and throughput rates [1]

Operating mode	Data throughput rate [2]	
	Forward link	Reverse link
CDMA 1xRTT	153 kbps	153 kbps
CDMA 1xEV-DO	3.1 Mbps	1.8 Mbps
WCDMA R99	384 kbps	384 kbps
WCDMA - HSDPA	7.2 Mbps	---
WCDMA - HSUPA	---	2.0 Mbps
GSM	14.4 kbps	14.4 kbps
GPRS	115 kbps	115 kbps
EDGE	384 kbps	384 kbps

[1] GPS position location can be enabled simultaneously with any airlink operating mode, or Rx diversity can be enabled during any CDMA or WCDMA operating mode.

[2] Target peak data rates are listed; actual throughput performance varies depending on operating and RF environment conditions.

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3.4 Electrostatic discharge protection

Electrostatic discharge (ESD) occurs naturally in laboratory and factory environments. An established high-voltage potential is always at risk of discharging to a lower potential. If this discharge path is through a semiconductor device, destructive damage may result.

ESD countermeasures and handling methods must be developed and used to control the UNDP-1 platform's environment.

QUALCOMM products must be handled according to the ESD Association standard: ANSI/ESD S20.20-1999, *Protection of Electrical and Electronic Parts, Assemblies, and Equipment*.

UNDP-1 electrostatic discharge (ESD) performance is specified in *UNDP-1 Universal Notebook Data Platform Device Specification* (80-VF329-1).

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4 RF Integration

4.1 RF operating frequencies

The UNDP-1 RF operating frequencies are summarized in Table 4-1.

Table 4-1 RF operating frequencies

Operating band	Tx frequency range	Rx frequency range
CDMA		
Cell (band class 0)	824 to 849 MHz	869 to 894 MHz
PCS (band class 1)	1850 to 1910 MHz	1930 to 1990 MHz
UMTS (WCDMA)		
Cell (band V)	824 to 849 MHz	869 to 894 MHz
PCS (band II)	1850 to 1910 MHz	1930 to 1990 MHz
IMT (band I)	1920 to 1980 MHz	2110 to 2170 MHz
GSM		
GSM850	824 to 849 MHz	869 to 894 MHz
GSM900	880 to 915 MHz	925 to 960 MHz
GSM1800	1710 to 1785 MHz	1805 to 1880 MHz
GSM1900	1850 to 1910 MHz	1930 to 1990 MHz
GPS position location	---	1574.42 to 1576.42 MHz

4.2 RF connections

The primary and secondary antenna connector locations are identified in Figure 2-1. Integrated antenna elements are connected to the UNDP-1 module via flexible RF coaxial cables with Hirose model number U.FL-R-SMT connectors. The UNDP-1 RF ports are designed to operate in 50 Ω systems; their inband source and load characteristic impedances are always 50 Ω nominal. A 10 dB return loss or better should be maintained over all operating bands throughout the antenna plus cabling systems.

Three additional points are worth highlighting:

- Use short 50 Ω cables for host-to-UNDP RF interconnections to minimize loss. Losses between an antenna and the receiver degrades sensitivity; loss in the transmit path requires additional PA output power (more DC power consumption).
- Use an appropriate tool for antenna cable connections; the Hirose U.FL connector removal tool is recommended.
- If Rx diversity and GPS position location are not supported, leave the unused secondary antenna unconnected.

4.3 Ground connections

Grounding is extremely important to UNDP-1 performance. The main system ground connections are mechanical, implemented by the mounting holes identified in Figure 2-1. Use these mounting holes to fasten the module to the host's ground system. In addition to these primary ground connections, the card edge connector provides additional electrical ground connections as listed in Table 2-1, and the RF cable assemblies provide the RF return paths that are also connected to system ground.

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4.4 Shielding and interference

Shielding is an extension of the system ground and must be installed to prevent interference between the host computer and the UNDP-1 platform. The platform is fully shielded (Figure 4-1), in accordance with FCC regulations (see [4] listed in Table 1-2).

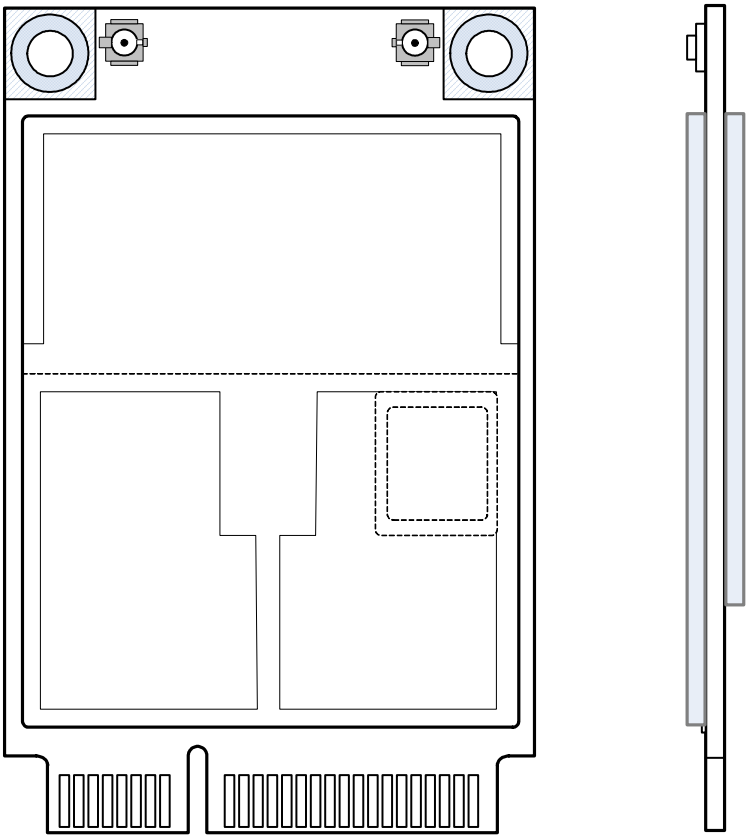

Figure 4-1 UNDP shields

NOTE These UNDP shields must not be removed.

The host PC is a hostile environment for RF transceivers, making the shields absolutely necessary. Potential interference sources include the following:

- Noise or ripple on the DC power supply voltage input lines, including transients due to switching-mode power supplies or host operating mode changes.
- High-speed digital logic transistions – The fast rising and falling edges include high frequency harmonics that can fall into the UNDP Rx and/or Tx passbands. Host circuits most likely to cause problems are the microprocessor, memory, and its displays and display drivers.
- Clocks – Also due to their high-speed transitions
- Other wireless devices, whether integrated into the host PC or external, such as WLAN (802.11) and Bluetooth devices. Transmit channels and their associated wideband noise can jam the UNDP receivers, and even their LO frequencies, digital logic, or clock signals can be disruptive.

Careful design is required to minimize the interference. UNDP-1 performance parameters, such as receiver sensitivity and transmitter spurious signals, should be evaluated to confirm adequate grounding and shielding, location of the UNDP antennas, and perhaps even placement and routing of other host computer functions. This evaluation should be performed for all UNDP-1 operating bands.

4.5 Antenna considerations

As mentioned in Section 4.4, the location of the antenna elements is critical to UNDP-1 RF performance. Routing the connecting coaxial cables could also impact UNDP performance; they should be routed away from corruptive noise sources (like the switching-mode power supplies, LCD assemblies, microprocessor, memory, etc).

Additional suggestions are provided in *Antenna Design Guidelines for Laptop and Notebook Computers (*80-H2929-1).

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5 Platform Communications

The main communications port between the host computer and the UNDP-1 platform (Figure 5-1) is the high-speed USB interface. This two-wire interface enables software downloads of boot, modem, and applications images, allows UNDP-1 status communications, and provides the control link from the host computer to the UNDP-1 platform. An off-chip USB transceiver (the USB ULPI PHY) is used to coordinate USB communications between the MDM1000 IC and the host computer.

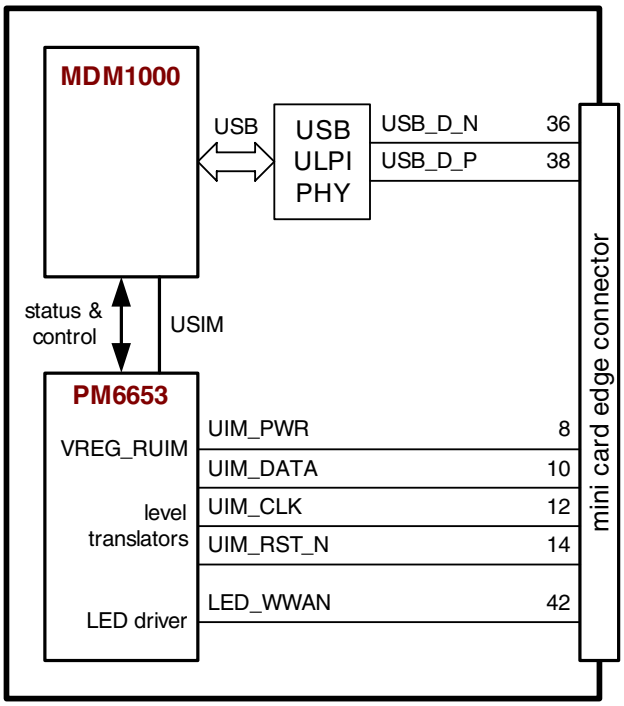

Figure 5-1 UNDP-1 communication interfaces

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An external RUIM/USIM is supported via the off-board UICC. The PM6653 IC provides the USIM power supply, thereby enabling support for both 1.8 V and 2.85 V UICCs. All digital signals are buffered and level-translated by the PM6653 IC as well, ensuring compatiblity between the external module and the MDM1000 IC.

The PMIC includes a programmable current driver (a current sink) that is used to drive an off-board LED as required by the *PCI Express Mini Card Electromechanical Specification* (key requirements are summarized in Table 5-1). The LED anode is expected to be connected to a 3.3 V supply (with a current limiting resistor if needed); the cathode is connected to the LED_WWAN pin that is driven by the PMIC current sink.

Table 5-1 LED communications

LED state	Message communicated
steady-state off	UNDP-1 is not on.
steady-state on	UNDP-1 is on and connected properly, but not transmitting or receiving data.
flashing at a steady, slow rate [1]	UNDP-1 is on, connected properly, and actively searching for an airlink connection.
flashing intermittently [2]	UNDP-1 is on, connected properly, and actively transmitting or receiving data.

[1] The flash rate is p.

[2] The flash rate is proportional to data activity, a 50% duty cycle with a flash rate between 3 Hz and 20 Hz.

NOTE Any unused interface should be left unconnected.

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6 Standards and Regulatory Compliance

6.1 Standards and certification

The UNDP-1 platform conforms to the following standards and certification requirements:

- CDMA
  - TIA/EIA IS-98E (CDMA2000 1x)
  - TIA/EIA IS-866 (1xEV-DO)
- UMTS (WCDMA)
  - TS 25.101
- GSM
  - TS 45.005
- FCC
  - 47 CFR Part 1 - RF radiation exposure limits
  - 47 CFR Part 2 - Equipment authorization
  - 47 CFR Part 15 - Unintentional radiators
  - 47 CFR Part 22 - Cellular
  - 47 CFR Part 24 - PCS
- CE
  - EMC protection requirements
    - EN 301 489-1 - Common technical requirements
    - EN 301 489-7 - GSM and DCS
    - EN 301 489-24 - WCDMA 2100
    - EN 301 489-25 - CDMA2000
  - Effective use of spectrum to avoid unwanted interference requirements
    - EN 301 908-1 - General requirements
    - EN 301 908-2 - WCDMA 2100
    - EN 301 908-4 - CDMA2000
    - EN 301 511 - GSM900/GSM1800
    - EN 301 607-1 - GSM900/GSM1800

- CTIA/GCF/PTCRB
- Safety
  - EN 50360/61 full carrier certification (carriers TBD)
- Microsoft® WHQL certification
- RoHS compliance

6.2 Regulatory information

6.2.1 Safety warnings

Do not operate the UNDP-1 platform in the following environments:

- In active blasting areas
- In potentially explosive environments such as refuelling points, fuel depots, or chemical plants
- Near medical equipment, especially life support equipment that might be susceptible to radio interference
- In an aircraft as follows:
  - UNDP-1 transmissions could interfere with aircraft electrical and communication systems. Like cell phones, using the UNDP-1 platform in an aircraft is illegal in some jurisdictions.
  - If cell phone usage is permitted while the aircraft is on the ground, normal UNDP operation is permitted as well.

6.2.2 North American compliance

The UNDP-1 platform has been authorized for mobile operation in North America. The initial authorization grant does not permit end user installation.

A permissive change will be submitted to add end user installation and/or portable usage conditions. The permissive change application includesdetailed information on UNDP-1's two-way authentication procedure preventing use of the module in unauthorized notebooks.

For mobile applications, the following conditions must be met:

1. Maintain at least a 20 cm separation between the antenna and the user's body.
2. Radiated transmit power must be equal to or lower than that specified in the FCC Grant of Equipment Authorization for FCC ID: J9CUNDP-1.
3. To comply with FCC/IC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed:
   - Cellular band < 4 dBi
   - PCS band < 3.5 dBi
4. Independent UNDP-1 operation — the UNDP-1 platform must not be co-located or jointly operated with any other transmitter or antenna within the host device.
5. A label with the following statements must be attached to the host end product:

   This device contains Tx FCC ID: J9CUNDP-1

   This equipment contains equipment certified under IC: 2723A-UNDP1
6. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC/IC RF exposure guidelines.
7. The host end product must also pass the FCC Part 15 unintentional emission testing requirement and be properly authorized per FCC Part 15.

For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093 and IC RSS-102.

6.2.3 EU compliance

The technical construction file of the UNDP-1 platform has been approved by the BABT notify body. The product is in conformity with the following standards for mobile operation in the EU:

- EN 301 489 -01
- EN 301 489 -07
- EN 301 489 -24
- EN 301 511
- EN 301 908 -01
- EN 301 908 -02
- EN 50360

For mobile applications, to comply with human exposure to RF radiation limits specified in EN 50360 and Council Recommendation 1999/519/EC, the following must be met:

1. Maintain at least 20 cm separation between the antenna and the user's body
2. The maximum antenna gain (including cable loss) must not exceed:
   - 900 MHz band < 3 dBi
   - 1800 MHz band < 9 dBi
   - IMT 2100 MHz band < 12 dBi
3. Independent UNDP-1 operation. The UNDP-1 platform must not be co-located or jointly operated with any other transmitter or antenna within the host device.

A CE mark shall be attached to the product.